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Research Article

The role of adoption, ease of use and teachers' experience of artificial intelligence on teaching effectiveness: Moderating role of student interest

Nguyen Thi Hang

Industrial University of Ho Chi Minh City, Vietnam (ORCID: 0009-0008-8180-9536)

Teaching effectiveness has been a prominent element in the success of the educational sector around the globe. The present study investigates the impact of adoption, ease of use, and teachers' experience of artificial intelligence [AI] and the moderating role of students' interest on the teaching effectiveness of Vietnamese universities. The study collected data from the students and teachers who are doing and teaching electrical and electronic engineering using survey questionnaires. The study also checks the validity and nexus among variables using smart-PLS. The outcomes indicated that the adoption, ease of use, and teachers' experience of AI have a positive linkage with the teaching effectiveness of Vietnamese universities. The outputs also revealed that student interest significantly moderates this relationship. The study helps the policymakers in developing policies related to enhance teaching effectiveness using effective AI adoption.

Keywords: Artificial intelligence adoption; Ease of use; Student interest; Teachers' experience of AI; Teaching effectiveness

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1. Introduction

The use of new technologies in the classroom is crucial for improving the quality of education. Utilizing AI to enhance learning outcomes and effectiveness in teaching has become a prominent trend in this industry. Universities in Vietnam are realizing more and more how important it is to include AI into a range of subject areas, including electrical and electronic engineering. Considering how quickly technology is developing, using AI in the classroom not only improves student learning outcomes but also gives them access to new options (Hernandez-de-Menendez et al., 2020). AI applications provide students with a variety of cutting-edge learning opportunities, from automation tools to teaching assistance systems (Guan et al., 2020). Vietnamese universities can retain their current level of progress while also encouraging creativity and innovation in the teaching and learning process by integrating cutting-edge technologies such as artificial intelligence with traditional teaching methods. As a result, building solid relationships with AI applications is essential to raising the standard of instruction and training at universities. This study focuses on the roles played by adoption of AI, ease of use, and teaching experience in

Address of Corresponding Author

Nguyen Thi Hang, Industrial University of Ho Chi Minh City, No.12 Nguyen Van Bao, Ward 4, Go Vap District, Ho Chi Minh City, Vietnam.

✉ nguyenthihangth@iuh.edu.vn

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teaching effectiveness. The study specifically looks at how student interest influences the relationship between these elements and the effectiveness of teaching. It is proposed that student interest plays a key mediating role in how other elements affect the efficacy of instruction.

The degree to which teachers and students embrace and utilize AI in the classroom is referred to as AI adoption in education. Adopting AI in electrical and electronic engineering may entail developing personalized learning experiences, giving students immediate feedback, and leveraging automation techniques to cut down on administrative work (Guan et al., 2020). Positive responses to AI adoption from teachers and students can improve the quality of instruction and advance the field's growth in Vietnam. The term "ease of use" refers to the efficiency and ease with which teachers and students can employ AI technologies. Facilitating user-friendly interfaces and efficient workflows can reduce participants' psychological and technical difficulties in Electrical and Electronic Engineering (Delgado et al., 2020). Bowden et al. (2021) Finds that students' interest and motivation can be greatly increased by ease of use, as they can experience now technologies without technical barriers. The degree of comfort and competence teachers have with utilizing AI technology to enhance the educational process is correlated with their experience teaching with AI (Calisto et al., 2021). Applying AI in Electrical and Electronic Engineering may call for advanced IT and subject understanding. The effectiveness of teaching and learning is directly impacted by the experience and trust of educators in utilizing AI. However, it is proposed that a key mediating factor in the relationship between AI adoption, ease of use, effectiveness, and teaching experience is student interest. The degree to which other elements influence how well students learn can be influenced by their passion for using AI (Xu & Ouyang, 2022). Thus, how AI affects the quality of instruction depends critically on student interest. To improve learning outcomes and influence educational practices at educational institutions, it is crucial to comprehend how student interest mediates the relationship between AI adoption, ease of use, teaching effectiveness, and teaching experience. Teachers can create ways to improve teaching effectiveness and foster student success in courses by recognizing the aspects that influence students' interest and engagement with AI technology (Jiao et al., 2022).

The study's specific goal is to determine how much AI adoption, ease of use, and teaching experience affect student outcomes and the effectiveness of teaching, with the role of student interest as a mediator. The study also aims to produce insights that can guide educational practices and policies in universities and support ongoing efforts to enhance learning outcomes in the field of Electrical and Electronic Engineering by identifying the factors that influence teaching effectiveness and student engagement with AI technologies. The study also addresses some of the gaps from previous literature. Firstly, while earlier studies have looked at the effects of AI adoption, ease of use, and teaching experience independently on teaching success, a lack of thorough studies has looked at how these elements interact and how their combined effects affect teaching effectiveness. Secondly, despite the growing significance of technology integration in the field of Electrical and Electronic Engineering, there is a lack of research explicitly addressing the Vietnamese context of higher education. Furthermore, a moderating influence of student interest on the relationship between AI adoption, ease of use, and teaching experience.

2. Literature Review

AI has revolutionized traditional instructional methods and changed the face of education. It has shown a favorable association with teaching effectiveness. In order to better address the varied requirements of their students, educators can optimize several facets of teaching and learning by bringing AI-powered tools and technology into classroom environments. The ability of AI to modify learning experiences to the requirements and tastes of specific students is a significant advantage of its adoption (Haleem et al., 2022). According to Guan et al.'s (2020) study, AI is capable of analyzing enormous volumes of student data, including learning preferences, performance indicators, and learning styles, due to advanced algorithms. By customizing training to each student's own learning profile, teachers may improve engagement, motivation, and

ultimately, learning results through the use of data-driven approaches (Luan et al., 2020). Furthermore, chat bots and virtual assistants driven by AI have become indispensable tools in the field of education, offering immediate assistance to educators and learners alike (Essel et al., 2022). These AI-powered resources provide 24/7 support, answering questions, giving constructive criticism, and assisting students with challenging material.

Artificial intelligence virtual assistants [AIVAs] according to Grewal et al. (2022) improve reactivity and accessibility, creating a more dynamic and encouraging learning environment that increases teaching efficacy. AI can also expedite administrative duties that are regular, like assigning grades and setting up exams, giving teachers more time to concentrate on instructional design and student engagement (Kim et al., 2022). AI frees up teachers to focus more on the unique requirements of each student, resulting in increased student engagement and more meaningful learning opportunities. This is achieved by automating these manual tasks. Moreover, teachers can make data-driven decisions on instructional strategies and interventions with the help of AI-based analytics (Demmans Epp et al., 2023). Larrabee Sønderlund et al. (2019) Finds that teachers are able to discover areas for improvement, identify effective teaching approaches, and conduct tailored interventions to support difficult learners by using real-time data analysis of student performance. With the use of this data-driven approach, teachers may modify their methods of education in real time, which improves student results and teaching effectiveness. Therefore, we propose the following hypothesis:

H1: AI adoption has a positive relation with teaching effectiveness.

The ways that Artificial Intelligence tools and technology are used in educational settings influences how well teachers engage with digital resources and employ data-driven insights to improve student learning experiences. This relationship is evident and favorable. AI programmes that are created with usability in mind are easier for teachers to use to optimize various aspects of training (Rerhaye et al., 2021). Easy-to-use AI technologies according to Rahiman and Kodikal (2024), make it easier for teachers to embrace and integrate new technology, lowering entrance barriers and promoting more seamless integration with current teaching methods. Teachers are empowered to confidently use AI systems due to intuitive interfaces and simple workflows (Calisto et al., 2021). This allows them to easily access relevant resources, analyses student data, and implement personalized interventions. Because of its accessibility, schools are encouraged to experiment and innovate, giving teachers the confidence to try out novel teaching techniques and use AI tools to adapt to the different requirements of their students.

Moreover, by automating repetitive chores and administrative duties, user-friendly AI programmes save instructors time and effort (Fernandez et al., 2024). AI reduces the amount of time spent on teaching by organizing course materials, grading assignments, and producing reports. This extra time can be used for more effective teaching strategies. This effectiveness boosts output while freeing up teachers to concentrate on developing deep relationships with students, offering specific help, and creating a supportive learning environment. Additionally, the ease of use of AI tools according to Chu et al. (2021), encourages teachers to collaborate and share knowledge, opening doors for professional development and group learning. Teachers are more inclined to work together on educational initiatives, exchange best practices, and take advantage of continuing professional development opportunities when AI platforms are user-friendly and easily available (Kohnke et al., 2023). Through the deliberate application of AI technology, this collaborative culture fosters a community of practice where educators can share ideas, solve problems together, and improve teaching efficacy. Therefore, we propose the following hypothesis:

H2: Ease of use of AI has a positive relation with teaching effectiveness.

AI has revolutionized the way teachers give instruction and promote student learning. Its teaching experience has shown a clear and favorable association with teaching effectiveness. With the development of AI technology, human-like teaching behaviors are rapidly being replicated, providing students with more engaging and comprehension-boosting personalized, adaptable,

and interactive learning experiences (Kohnke et al., 2023). The ability to offer individualized learning routes adapted to each student's requirements and preferences is a key benefit of AI-driven educational experiences (Kaswan et al., 2024). Through the analysis of extensive student data, AI algorithms may detect deficiencies in learning, monitor advancement, and suggest focused interventions. This enables educators to effectively adapt to the individual learning needs of each student. This individualized strategy improves academic achievements by encouraging deeper knowledge and mastery of ideas in addition to increasing student enthusiasm. Furthermore, Al Rajab et al. (2023) finds that AI-powered learning environments are engaging and immersive because of the use of cutting-edge technology like machine learning and natural language processing. Students can participate in dynamic and responsive exchanges with virtual tutors, chat bots, and intelligent tutoring systems, and receive immediate feedback, direction, and assistance (Kuhail et al., 2023). This interactive feedback loop improves learning by encouraging active engagement and the development of critical thinking abilities while offering quick assistance and mentoring.

According to Srinivasa et al.'s (2022) study, AI-driven learning environments may also adjust to each student's unique learning preferences and styles, meeting a range of learning demands and optimizing the effectiveness of education. AI makes sure that every student gets individualized support and challenges that are suitable for their ability level by dynamically modifying material, pacing, and difficulty levels based on real-time student performance data (Bhutoria, 2022). Because of its flexibility, the learning atmosphere is more welcoming and equal, where all students have the opportunity to succeed and thrive. Therefore, we propose the following hypothesis:

H3: Teachers' experience of AI has a positive relation with teaching effectiveness.

In the relationship between the adoption of AI and the effectiveness of teaching, student interest plays a crucial mediating role, acting as a stimulant for motivation, engagement, and eventually academic success. AI technologies have the power to completely transform education when they are skillfully incorporated into teaching methods in a way that appeals to students' interests (Ebadi & Amini, 2022). Passive learners can become active participants in their education by using AI-driven tools and platforms that are designed to grab and hold students' interest. This gives them a sense of agency and ownership over their educational process. Kabudi et al. (2021) claims that teachers can develop dynamic, interactive learning environments that connect with students deeper by using AI to personalize lessons and adapt to particular student preferences. AI has countless opportunities for meaningfully and pertinently engaging students, whether through interactive learning games, immersive virtual simulations, or adaptive learning algorithms (Yu & Lu, 2021). Furthermore, AI-powered resources that offer real-time feedback, tailored guidance, and flexible tasks enable learners to investigate and grasp intricate ideas at their own speed, cultivating a feeling of independence and proficiency in their education.

It is found by Ebadi and Amini (2022) that AI can also stimulate curiosity, creativity, and intrinsic drive in students by leveraging their innate interests and passions. This promotes deeper learning and knowledge retention over the long term. AI can customize learning experiences to each student's unique interests, whether they are drawn to technology, literature, art, or sports, making the subject matter more personally meaningful and applicable (Walkington & Bernacki, 2019). In addition to increasing student engagement, this individualized method fosters a positive attitude towards learning, which paves the way for both academic success and lifetime learning habits. Therefore, we propose the following hypothesis:

H4: Student interest moderates the relation of AI adoption and teaching effectiveness.

The relationship between the ease of use of AI and the effectiveness of teaching is significantly mediated by student interest. With user-friendly interfaces and easy processes, AI solutions that are seamlessly incorporated into educational practices allow teachers to improve student engagement and learning outcomes (Dimitriadou & Lanitis, 2023). Easy-to-use AI systems make difficult jobs like grading, material organization, and feedback generation simpler, freeing up teachers to concentrate more on promoting meaningful student interactions and learning. AI

technology' ease of use and accessibility have a significant influence on stimulating and maintaining students' interest (Choi et al., 2023). Students are more inclined to accept AI technologies as important resources in their learning process when they find them to be simple to use and navigate. Higher motivation, participation, and excitement for learning result from this enhanced engagement, which eventually helps to improve academic results (Yu et al., 2021).

Moreover, it is found by Nguyen et al. (2023) that by giving students more freedom and control over their education, user-friendly AI systems encourage them to take charge of their education. Students can explore content at their own leisure, delve into areas of interest, and participate in self-directed learning experiences because of user-friendly interfaces and personalized learning pathways. In addition to encouraging independence and responsibility, this autonomy pushes students to take an increasingly active role in their own education (Reeve & Cheon, 2021). Additionally, Allal-Chérif et al. (2021) finds that students are more inclined to work with peers, look for more resources, and participate in conversations when they are actively using user-friendly AI technologies. This results in a livelier and engaging learning environment. Effective teaching requires critical thinking, communication skills, and teamwork, all of which are fostered by this cooperative learning environment. Therefore, we propose the following hypothesis:

H5: Student interest moderates the relation of ease of use of AI and teaching effectiveness.

When it comes to the relationship between teaching effectiveness and the AI experience, student interest plays a crucial mediating role. AI technologies stimulate students' attention and improve the effectiveness of teaching when they provide personalized, dynamic, and engaging learning experiences (Huang et al., 2023). Students connect more deeply with AI-driven educational experiences that imitate human-like behaviors including offering personalized feedback, accommodating different learning styles, and distributing interactive content. According to Khosravi et al. (2022), AI creates a feeling of relevance and connection to the topic by customizing training to each student's preferences and needs. This encourages students to actively engage in the learning process. AI-powered learning environments can also adjust to students' innate passions and interests, fostering intrinsic motivation, creativity, and curiosity (Huang et al., 2023). AI encourages deeper learning and long-term memory retention by engaging students in meaningful ways, whether through immersive simulations, interactive lessons, or personalized learning pathways. In addition to increasing student engagement, this individualized approach fosters a positive attitude towards learning and lays the groundwork for academic achievement (Bowden et al., 2021).

Additionally, Srinivasa et al. (2022) finds that students who actively participate in AI-driven learning experiences are more inclined to work with classmates, look for new resources, and take part in class debates, all of which contribute to a more vibrant and engaging learning environment. This cooperative learning style encourages critical thinking, good communication, and teamwork, all of which enhance the effectiveness of instruction (Bowden et al., 2021). Hence, teachers can establish more captivating, inclusive, and productive learning environments that enable students to succeed academically and personally by giving priority to student interest in AI-driven learning experiences. Therefore, we propose the following hypothesis:

H6: Student interest moderates the relation of teachers' experience of AI and teaching effectiveness.

3. Methodology

3.1. Research Design

The study investigates the impact of adoption, ease of use, and teachers' experience of AI on the teaching effectiveness and also investigates the moderating role of students' interest among adoption, ease of use, teachers' experience of AI, and teaching effectiveness of Vietnamese universities.

3.2. Participants

The study selected the students and teachers of the Vietnamese private universities who are doing and teaching electrical and electronic engineering. The study used the purposive sampling to select the respondents. The surveys were sent to the selected respondents using personal visits to the universities. A total of 614 surveys were sent but only 355 surveys were received. These surveys have around 57.82 percent response rate.

3.3. Data Collection

The study collected data from the students and teachers who are doing and teaching electrical and electronic engineering using survey questionnaires. The question statements were used to measure the constructs. For example, AI adoption is measured with five questions (Oduro, 2020), ease of use also measured with five questions (Lazar et al., 2020), teachers' experience of AI is measured with six questions (Lazar et al., 2020), students' interest is measured with eight questions (Mazer, 2012) and teaching effectiveness is measured with three questions (Frick et al., 2009). These questions are given in Table 1.

Table 1
Measurement Scale of the Variables

Items	*Statements*	*Sources*
AI Adoption		
AIA1	We adopt AI to improve our internal (R&D) and innovation processes.	(Oduro, 2020)
AIA2	We use the AI model to gain knowledge and expertise that we do not have internally.	
AIA3	Our enterprise uses AI to reduce the high cost of innovating alone.	
AIA4	We use AI to counterbalance our lack of capacity.	
AIA5	We use AI to secure market share growth and global market reach.	
Ease of Use		
EOU1	I find digital tools to be easy to use from anywhere.	(Lazar et al., 2020)
EOU2	Using any digital tools is clear and logical.	
EOU3	Digital tools provide flexibility in interaction with the user.	
EOU4	I could easily acquire useful skills needed to use any digital tools.	
EOU5	I find digital tools to be easy to use anytime.	
Teachers' Experience of AI		
TEAI1	I am most familiar with the interactive board Interactive learning tool–a new generation.	(Lazar et al., 2020)
TEAI2	I am most familiar with the Internet of Things.	
TEAI3	I am most familiar with software like IBM SPSS1 software.	
TEAI4	I am most familiar with online course materials.	
TEAI5	I am most familiar with e-textbooks.	
TEAI6	I am most familiar with smartphones and tablets.	
Student Interest		
SI1	I feel enthused about being in class.	(Mazer, 2012)
SI2	I feel the class makes me feel excited.	
SI3	The class causes me to feel energized.	
SI4	The topics covered in the course fascinate me.	
SI5	Being in the class is enjoyable.	
SI6	The class experience makes me feel good.	
SI7	The material fascinates me.	
SI8	I like the things we cover in class.	

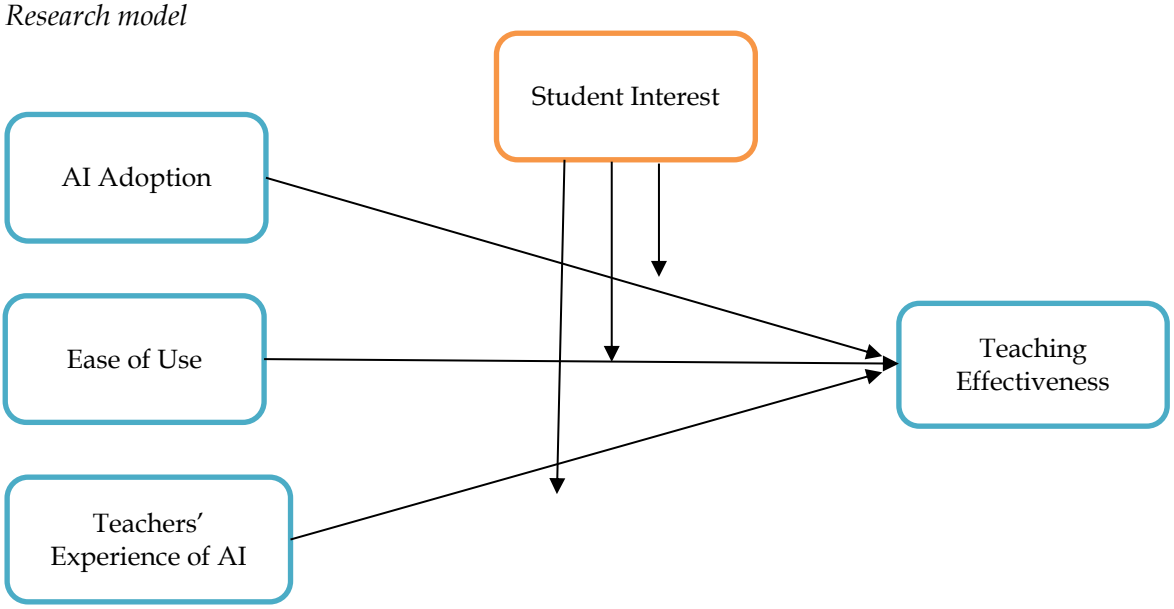
Table 1 continued

Items	*Statements*	*Sources*
Teaching Effectiveness		
TE1	I frequently did excellent work on projects, assignments, problems, and learning activities for this course.	(Frick et al., 2009)
TE2	I spent much time doing tasks, projects, and assignments, and my instructor judged my work as high-quality.	
TE3	I put a great deal of effort and time into this course, which has paid off—I believe I have done very well overall.	

3.4. Data Analysis

In addition, the study also checks the validity and nexus among variables using smart-PLS. The smart-PLS is commonly used for the analysis of primary data and provides best results using large data sets (Hair et al., 2020). Finally, the article utilized three predictors named AI adoption [AIA], ease of use [EOU], and teachers' experience of AI [TEAI] while the study also utilized one moderating variable named students' interest [SI] and one predictive variable named teaching effectiveness [TE]. These variables are given in Figure 1.

Figure 1
Research model



4. Findings

The study checks the convergent validity that exposed the correlation between items. The correlation among items is checked using Alpha and composite reliability [CR] and results exposed values more than .70. In addition, it is also checked using factor loadings and average variance extracted [AVE] and results exposed values more than .50. These outcomes indicated a high correlation between items. These results are given in Table 2.

The study also checks the discriminant validity that exposed the correlation between variables. The correlation among variables is checked using cross-loadings and Fornell Larcker criteria and results exposed that the figures that exposed the association among construct itself are bigger than the figures that exposed the association among other variables. These outcomes indicated a low correlation between variables. These results are given in Table 3 and Table 4.

Table 2
Convergent Validity of the scales

Constructs and Items	*Loadings*	*Alpha*	*CR*	*AVE*
Adoption of AI				
AIA1	0.802	.901	.927	.718
AIA2	0.882			
AIA3	0.861			
AIA4	0.886			
AIA5	0.801			
Ease of Use				
EOU1	0.892	.914	.936	.745
EOU2	0.788			
EOU3	0.886			
EOU4	0.875			
EOU5	0.874			
Student Interest				
SI1	0.844	.860	.896	.591
SI2	0.835			
SI4	0.709			
SI6	0.785			
SI7	0.772			
SI8	0.651			
Teaching Effectiveness				
TE1	0.867	.725	.849	.655
TE2	0.889			
TE3	0.652			
Teachers' Experience of AI				
TEAI1	0.777	.860	.896	.590
TEAI2	0.693			
TEAI3	0.851			
TEAI4	0.764			
TEAI5	0.695			
TEAI6	0.815			

Table 3
Discriminant validity results using Fornell Larcker criteria

	AIA	*EOU*	*SI*	*TE*	*TEAI*
AIA	0.847				
EOU	0.528	0.863			
SI	0.466	0.463	0.769		
TE	0.650	0.567	0.679	0.810	
TEAI	0.596	0.448	0.515	0.613	0.768

Table 4 presents the cross-loadings of the items.

Table 4
Cross-loadings according to Fornell Larcker criteria

	AIA	*EOU*	*SI*	*TE*	*TEAI*
AIA1	**0.802**	0.438	0.298	0.460	0.493
AIA2	**0.882**	0.440	0.392	0.583	0.546
AIA3	**0.861**	0.459	0.384	0.612	0.525
AIA4	**0.886**	0.484	0.462	0.573	0.507
AIA5	**0.801**	0.417	0.430	0.507	0.448

Table 4 continued

	AIA	*EOU*	*SI*	*TE*	*TEAI*
EOU1	0.481	**0.892**	0.422	0.498	0.392
EOU2	0.430	**0.788**	0.394	0.485	0.376
EOU3	0.467	**0.886**	0.382	0.502	0.392
EOU4	0.457	**0.875**	0.434	0.490	0.389
EOU5	0.442	**0.874**	0.366	0.471	0.382
SI1	0.442	0.381	**0.844**	0.632	0.477
SI2	0.316	0.373	**0.835**	0.550	0.355
SI4	0.417	0.439	**0.709**	0.514	0.431
SI6	0.357	0.301	**0.785**	0.517	0.412
SI7	0.257	0.297	**0.772**	0.469	0.320
SI8	0.344	0.346	**0.651**	0.416	0.366
TE1	0.544	0.440	0.539	**0.867**	0.521
TE2	0.541	0.468	0.663	**0.889**	0.420
TE3	0.489	0.468	0.427	**0.652**	0.558
TEAI1	0.510	0.424	0.401	0.526	**0.777**
TEAI2	0.385	0.320	0.390	0.422	**0.693**
TEAI3	0.506	0.380	0.445	0.535	**0.851**
TEAI4	0.525	0.339	0.361	0.493	**0.764**
TEAI5	0.347	0.249	0.425	0.337	**0.695**
TEAI6	0.433	0.320	0.369	0.468	**0.815**

The study also checks the discriminant validity that exposed the correlation between variables. The correlation among variables is checked using cross-loadings and Fornell Larcker Heterotrait Monotrait [HTMT] ratio and results exposed that the figures are less than 0.90. These outcomes indicated a low correlation between variables. These results are given in Table 5.

Table 5
Discriminant validity results using Heterotrait Monotrait Ratio

	AIA	*EOU*	*SI*	*TE*	*TEAI*
AIA					
EOU	0.582				
SI	0.525	0.523			
TE	0.803	0.702	0.849		
TEAI	0.667	0.498	0.601	0.776	

Figure 2 shows the cross-loadings of the items in subscales visually. Finally, the outcomes indicated that the adoption, ease of use, and teachers' experience of AI have a positive linkage with the teaching effectiveness of Vietnamese universities and accept H1, H2 and H3. In addition, the outputs also revealed that student interest significantly moderates among adoption, ease of use, teachers' experience of AI and teaching effectiveness of Vietnamese universities and accept H4, H5 and H6. These results are given in Table 6.

Figure 2
Measurement Model Assessment

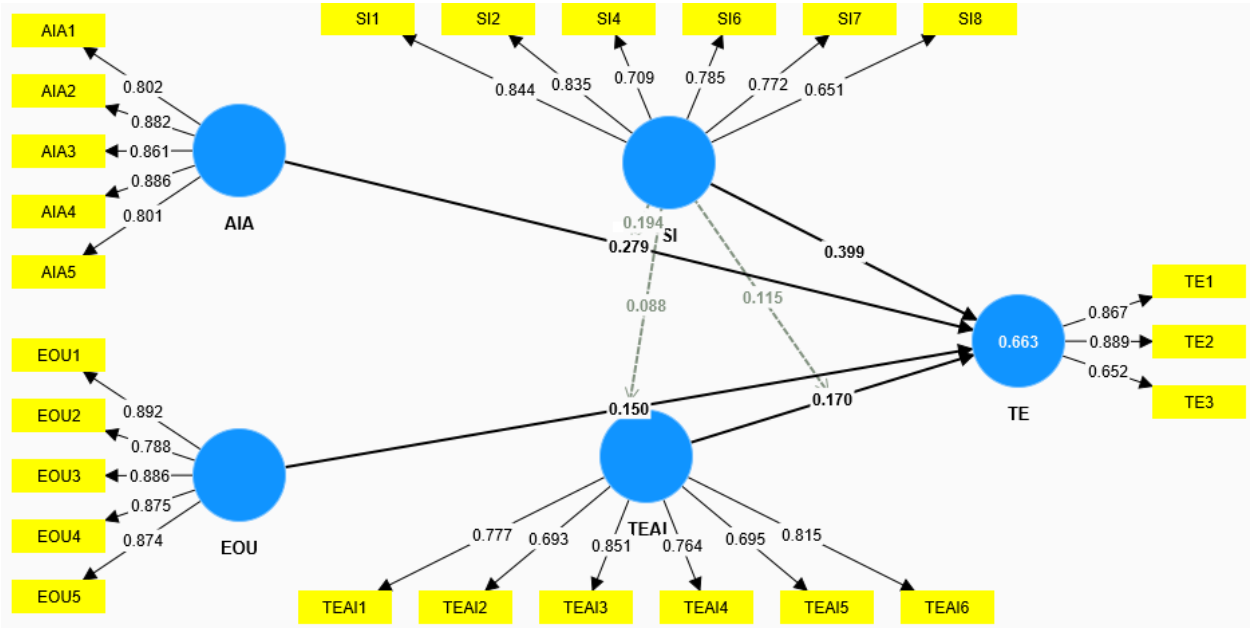
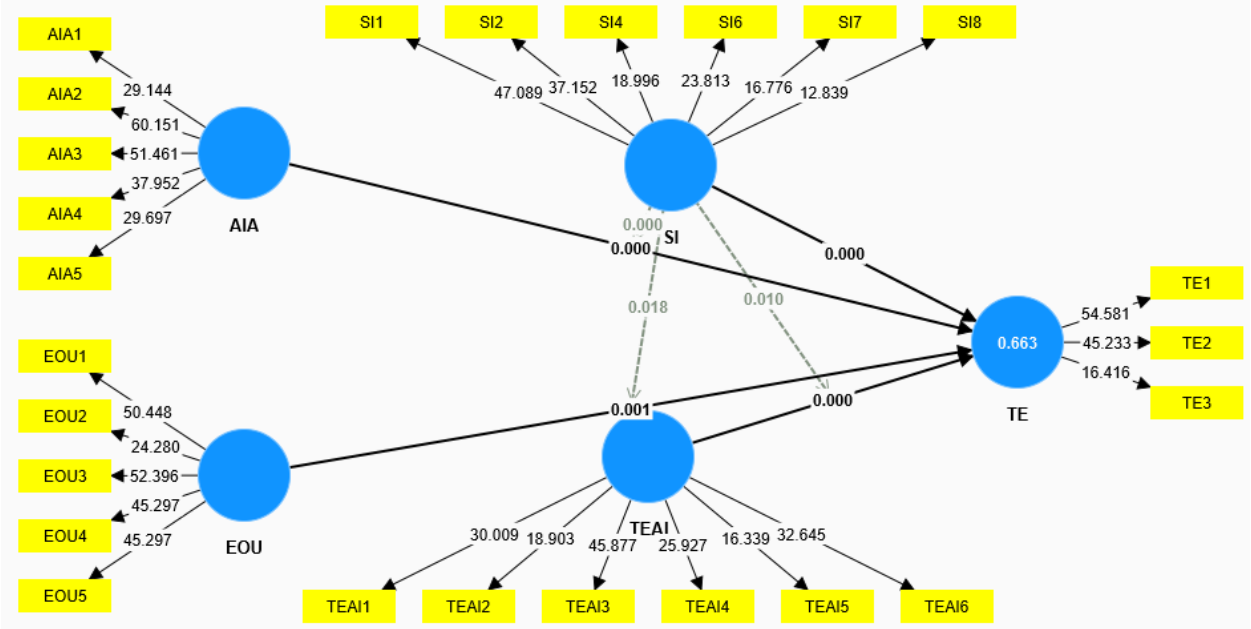


Table 6
Path Analysis for the model

Relationships	*Beta*	*SD*	*t-Statistics*	*p-values*
AIA→TE	0.279	0.043	6.563	.000
EOU → TE	0.150	0.043	3.500	.001
SI → TE	0.399	0.043	9.252	.000
TEAI → TE	0.170	0.048	3.543	.000
SI x EOU → TE	0.088	0.037	2.363	.018
SI x AIA → TE	0.194	0.042	4.562	.000
SI x TEAI → TE	0.115	0.044	2.601	.010

Figure 3 presents the structural equation modelling results for the study variables.

Figure 3
Structural Model Assessment



As can be seen, Figure 3 shows the relationships among the variables. This result also supports our hypotheses that student interest plays a moderating role in the impact of artificial intelligence adoption, ease of use, and teachers' experience of AI on the teaching effectiveness.

5. Discussion

The findings of this study provide insight into the intricate interactions among AI adoption, ease of use, teaching effectiveness, and student interest. Firstly, the study shows that the use of AI in the classroom has a substantial impact on how effective teaching is delivered. This emphasizes the significance of institutional support, teacher preparation, and student acceptance in facilitating the effective use of AI in the classroom. The correlation between the use of AI and the effectiveness of teaching is positive as also found by Haleem et al. (2022) and Essel et al. (2022), highlighting the potential of AI technologies to improve the quality of learning experiences by streamlining administrative processes and personalizing instruction. To optimize the advantages of AI in education, the research also identifies obstacles to its implementation, including reluctance to change, a lack of funding, and insufficient training. The second finding highlights the significance of user-friendly interfaces, intuitive processes, and technical assistance in promoting teachers' and students' engagement with AI technologies. The ease of use of AI emerges as a crucial element determining teaching effectiveness (Fernandez et al., 2024). The study emphases the necessity of continuous professional development initiatives and systems of support to improve teachers' digital literacy and self-assurance in applying AI to teaching. Additionally, it is crucial to support student efforts to develop digital literacy in order to guarantee their active involvement and participation in AI-enhanced learning settings (Bowden et al., 2021).

The study also emphasizes how teaching experience with AI shapes teaching effectiveness and how crucial it is for teachers to be proficient and confident in using AI technology to maximize learning and teaching outcomes. Teachers who have a great deal of expertise incorporating AI into their lessons are better able to use AI tools to modify lessons, examine student data, and offer focused assistance (Kuhail et al., 2023). Thus, to fully utilize AI in education, funding training courses and other materials that improve teachers' use of AI in the classroom is crucial. The study also emphasizes how student interest moderates the relationship between AI adoption, ease of use, efficacy, and teaching experience. An important mediator that affects how other elements affect the effectiveness of teaching is student interest. Students are more likely to participate in learning activities, look for more resources, and produce higher learning results when they are actively engaged and enthusiastic in employing AI technologies (Bowden et al., 2021). Therefore, the main objective of educational interventions meant to improve the effectiveness of teaching at Vietnamese institutions should be to encourage student interest and motivation. Overall, these findings offer insightful information on what makes AI integration into teaching practices successful as well as how it affects the efficacy of instruction in Electrical and Electronic Engineering Technology courses offered in Vietnamese universities. In order to fully utilize AI technologies and enhance learning outcomes for students in Vietnam and elsewhere, educators, policymakers, and researchers must first understand the intricate relationships that exist between AI adoption, ease of use, teaching effectiveness, and student interest. Only then can they develop evidence-based strategies. To determine the best strategies for implementing AI in educational settings and to investigate the long-term impacts of AI integration on teaching and learning processes, more study is required. The study helps the policymakers in developing policies related to enhance teaching effectiveness using effective AI adoption.

6. Implications

This study has broad implications for future research, policy, and educational practice in the context of Electrical and Electronic Engineering Technology courses in Vietnamese institutions. Firstly, the results highlight the significance of encouraging teachers and students to accept AI, stressing the necessity of institutional support, training initiatives, and resources to enable the

effective integration of AI into instructional strategies. To maximize the benefits of AI in education, educational authorities and administrators should give priority to efforts that promote digital literacy skills and develop an innovative culture. Secondly, in order to guarantee teachers' and students' active engagement and participation, efforts must be made to improve the usability of AI technology. Teachers may become more proficient and confident in their use of AI by investing in user-friendly interfaces, intuitive processes, and technical support systems. This will ultimately improve learning outcomes and increase the effectiveness of teaching. The study also emphasizes how critical it is to develop students' desire and interest in AI-enhanced learning settings.

7. Limitations and Future Directions

Despite the fact that this study offers insightful information about the impact of AI adoption, usability, teaching experience, and student interest on the efficacy of instruction in the context of Electrical and Electronic Engineering Technology courses in Vietnamese universities, the study also has several limitations. First of all, the study depends on teacher and student self-reported data, which can contain errors and biases in their responses. To gain a more comprehensive knowledge of the effects of AI adoption, ease of use, teaching experience, and student interest on teaching effectiveness, future research could benefit from include objective assessments of these characteristics. Secondly, while students and teachers may be the primary stakeholders in advancing AI integration in education, the study ignores the perspectives of administrators, industry partners, and educational policymakers. A multi-stakeholder method could be used in future research to examine the wider effects of the use of AI in Vietnamese universities. Furthermore, the focus of this study on Electrical and Electronic Engineering Technology courses may limit its generalizability because these courses may have particular qualities not found in other fields.

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Data availability: Data generated or analyzed during this study are available from the author on request.

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References

Al Rajab, M., Odeh, S., Hazboun, S., & Alheeh, E. (2023). *AI-powered smart book: enhancing arabic education in Palestine with augmented reality* [Paper presentation]. International Symposium on Ambient Intelligence, Guimaraes, Portugal. https://doi.org/10.1007/978-3-031-43461-7_17

Allal-Chérif, O., Aránega, A. Y., & Sánchez, R. C. (2021). Intelligent recruitment: How to identify, select, and retain talents from around the world using artificial intelligence. *Technological Forecasting and Social Change, 169*, 120-822. https://doi.org/10.1016/j.techfore.2021.120822

Bhutoria, A. (2022). Personalized education and artificial intelligence in the United States, China, and India: A systematic review using a human-in-the-loop model. *Computers and Education: Artificial Intelligence, 3*, 100-168. https://doi.org/10.1016/j.caeai.2022.100068

Bowden, J. L.-H., Tickle, L., & Naumann, K. (2021). The four pillars of tertiary student engagement and success: a holistic measurement approach. *Studies in Higher Education, 46*(6), 1207-1224. https://doi.org/10.1080/03075079.2019.1672647

Calisto, F. M., Santiago, C., Nunes, N., & Nascimento, J. C. (2021). Introduction of human-centric AI assistant to aid radiologists for multimodal breast image classification. *International Journal of Human-Computer Studies, 150*, 102-607. https://doi.org/10.1016/j.ijhcs.2021.102607

Choi, S., Jang, Y., & Kim, H. (2023). Influence of pedagogical beliefs and perceived trust on teachers' acceptance of educational artificial intelligence tools. *International Journal of Human–Computer Interaction, 39*(4), 910-922. https://doi.org/10.1080/10447318.2022.2049145

Chu, S. K. W., Reynolds, R. B., Tavares, N. J., Notari, M., & Lee, C. W. Y. (2021). *21st century skills development through inquiry-based learning from theory to practice*. Springer.

Delgado, J. M. D., Oyedele, L., Demian, P., & Beach, T. (2020). A research agenda for augmented and virtual reality in architecture, engineering and construction. *Advanced Engineering Informatics, 45*, 101-122. https://doi.org/10.1016/j.aei.2020.101122

Demmans Epp, C., Daniel, B. K., & Muldner, K. (2023). Learning analytics for supporting individualization: data-informed adaptation of learning. *Frontiers in Education, 8,* 1240377. https://doi.org/10.3389/feduc.2023.1240377

Dimitriadou, E., & Lanitis, A. (2023). A critical evaluation, challenges, and future perspectives of using artificial intelligence and emerging technologies in smart classrooms. *Smart Learning Environments, 10*(1), 12-21. https://doi.org/10.1186/s40561-023-00231-3

Ebadi, S., & Amini, A. (2022). Examining the roles of social presence and human-likeness on Iranian EFL learners' motivation using artificial intelligence technology: A case of CSIEC chatbot. *Interactive Learning Environments*, *32*(2), 655-673. https://doi.org/10.1080/10494820.2022.2096638

Essel, H. B., Vlachopoulos, D., Tachie-Menson, A., Johnson, E. E., & Baah, P. K. (2022). The impact of a virtual teaching assistant (chatbot) on students' learning in Ghanaian higher education. *International Journal of Educational Technology in Higher Education, 19*(1), 45-57. https://doi.org/10.1186/s41239-022-00362-6

Fernandez, D., Dastane, O., Omar Zaki, H., & Aman, A. (2024). Robotic process automation: bibliometric reflection and future opportunities. *European Journal of Innovation Management, 27*(2), 692-712. https://doi.org/10.1108/EJIM-10-2022-0570

Frick, T. W., Chadha, R., Watson, C., Wang, Y., & Green, P. (2009). College student perceptions of teaching and learning quality. *Educational Technology Research and Development, 57*, 705-720. https://doi.org/10.1007/s11423-007-9079-9

Grewal, D., Guha, A., Schweiger, E., Ludwig, S., & Wetzels, M. (2022). How communications by AI-enabled voice assistants impact the customer journey. *Journal of Service Management, 33*(4/5), 705-720. https://doi.org/10.1108/JOSM-11-2021-0452

Guan, C., Mou, J., & Jiang, Z. (2020). Artificial intelligence innovation in education: A twenty-year data-driven historical analysis. *International Journal of Innovation Studies, 4*(4), 134-147. https://doi.org/10.1016/j.ijis.2020.09.001

Hair Jr, J. F., Howard, M. C., & Nitzl, C. (2020). Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. *Journal of Business Research, 109*, 101-110. https://doi.org/10.1016/j.jbusres.2019.11.069

Haleem, A., Javaid, M., & Singh, R. P. (2022). An era of ChatGPT as a significant futuristic support tool: A study on features, abilities, and challenges. *BenchCouncil Transactions on Benchmarks, Standards and Evaluations, 2*(4), 100-189. https://doi.org/10.1016/j.tbench.2023.100089

Hernandez-de-Menendez, M., Escobar Díaz, C., & Morales-Menendez, R. (2020). Technologies for the future of learning: state of the art. *International Journal on Interactive Design and Manufacturing, 14*(2), 683-695. https://doi.org/10.1007/s12008-019-00640-0

Huang, A. Y., Lu, O. H., & Yang, S. J. (2023). Effects of artificial Intelligence–Enabled personalized recommendations on learners' learning engagement, motivation, and outcomes in a flipped classroom. *Computers & Education, 194*, 104-684. https://doi.org/10.1016/j.compedu.2022.104684

Jiao, P., Ouyang, F., Zhang, Q., & Alavi, A. H. (2022). Artificial intelligence-enabled prediction model of student academic performance in online engineering education. *Artificial Intelligence Review, 55*(8), 6321-6344. https://doi.org/10.1007/s10462-022-10155-y

Kabudi, T., Pappas, I., & Olsen, D. H. (2021). AI-enabled adaptive learning systems: A systematic mapping of the literature. *Computers and Education: Artificial Intelligence, 2*, 100-117. https://doi.org/10.1016/j.caeai.2021.100017

Kaswan, K. S., Dhatterwal, J. S., & Ojha, R. P. (2024). AI in personalized learning. In A. Garg, B. V. Babu, & V. E. Balas (Eds.), *Advances in Technological Innovations in Higher Education* (pp. 103-117). CRC Press.

Khosravi, H., Shum, S. B., Chen, G., Conati, C., Tsai, Y.-S., Kay, J., Knight, S., Martinez-Maldonado, R., Sadiq, S. & Gašević, D. (2022). Explainable artificial intelligence in education. *Computers and Education: Artificial Intelligence, 3*, 100-124. https://doi.org/10.1016/j.caeai.2022.100074

Kim, J., Lee, H., & Cho, Y. H. (2022). Learning design to support student-AI collaboration: Perspectives of leading teachers for AI in education. *Education and Information Technologies, 27*(5), 6069-6104. https://doi.org/10.1007/s10639-021-10831-6

Kohnke, L., Moorhouse, B. L., & Zou, D. (2023). Exploring generative artificial intelligence preparedness among university language instructors: A case study. *Computers and Education: Artificial Intelligence, 5*, 100-156. https://doi.org/10.1016/j.caeai.2023.100156

Kuhail, M. A., Alturki, N., Alramlawi, S., & Alhejori, K. (2023). Interacting with educational chatbots: A systematic review. *Education and Information Technologies, 28*(1), 973-1018. https://doi.org/10.1007/s10639-022-11177-3

Larrabee Sønderlund, A., Hughes, E., & Smith, J. (2019). The efficacy of learning analytics interventions in higher education: A systematic review. *British Journal of Educational Technology, 50*(5), 2594-2618. https://doi.org/10.1111/bjet.12720

Lazar, I. M., Panisoara, G., & Panisoara, I. O. (2020). Digital technology adoption scale in the blended learning context in higher education: Development, validation and testing of a specific tool. *Plos One, 15*(7), 1-27. https://doi.org/10.1371/journal.pone.0235957

Luan, H., Geczy, P., Lai, H., Gobert, J., Yang, S. J., Ogata, H., Baltes, J., Guerra, R., Li, P. & Tsai, C.-C. (2020). Challenges and future directions of big data and artificial intelligence in education. *Frontiers in Psychology, 11*, 580820. https://doi.org/10.3389/fpsyg.2020.580820

Mazer, J. P. (2012). Development and validation of the student interest and engagement scales. *Communication Methods and Measures, 6*(2), 99-125. https://doi.org/10.1080/19312458.2012.679244

Nguyen, A., Ngo, H. N., Hong, Y., Dang, B., & Nguyen, B.-P. T. (2023). Ethical principles for artificial intelligence in education. *Education and Information Technologies, 28*(4), 4221-4241. https://doi.org/10.1007/s10639-022-11316-w

Oduro, S. (2020). Exploring the barriers to SMEs' open innovation adoption in Ghana: A mixed research approach. *International Journal of Innovation Science, 12*(1), 21-51. https://doi.org/10.1108/IJIS-11-2018-0119

Rahiman, H. U., & Kodikal, R. (2024). Revolutionizing education: Artificial intelligence empowered learning in higher education. *Cogent Education, 11*(1), 229-3431. https://doi.org/10.1080/2331186X.2023.2293431

Reeve, J., & Cheon, S. H. (2021). Autonomy-supportive teaching: Its malleability, benefits, and potential to improve educational practice. *Educational Psychologist, 56*(1), 54-77. https://doi.org/10.1080/00461520.2020.1862657

Rerhaye, L., Altun, D., Krauss, C., & Müller, C. (2021). Evaluation methods for an AI-supported learning management system: quantifying and qualifying added values for teaching and learning. In R. A. Sottilare, & J. Schwarz (Eds.), *Adaptive Instructional Systems. Design and Evaluation: Third International Conference Proceedings* (pp. 394-411). Springer. https://doi.org/10.1007/978-3-030-77857-6_28

Srinivasa, K., Kurni, M., & Saritha, K. (2022). Harnessing the power of AI to education. In K. Srinivasa, M. Kurni, & K. Saritha (Eds.), *Learning, teaching, and assessment methods for contemporary learners: pedagogy for the digital generation* (pp. 311-342). Springer. http://dx.doi.org/10.1007/978-981-19-6734-4_13

Walkington, C., & Bernacki, M. L. (2019). Personalizing algebra to students' individual interests in an intelligent tutoring system: Moderators of impact. *International Journal of Artificial Intelligence in Education, 29*, 58-88. https://doi.org/10.1007/s40593-018-0168-1

Xu, W., & Ouyang, F. (2022). A systematic review of AI role in the educational system based on a proposed conceptual framework. *Education and Information Technologies, 27*(3), 4195-4223. https://doi.org/10.1007/s10639-021-10774-y

Yu, S., & Lu, Y. (2021). *An introduction to artificial intelligence in education*. Springer. https://doi.org/10.1007/978-981-16-2770-5

Yu, Z., Gao, M., & Wang, L. (2021). The effect of educational games on learning outcomes, student motivation, engagement and satisfaction. *Journal of Educational Computing Research, 59*(3), 522-546. https://doi.org/10.1177/0735633120969214